Session VII

Developments in the IntelliFIBER™ Fiber Optic Fence Sensor

By Dr. Mel Maki, Jeremy Weese

Senstar-Stellar Corporation, 119 John Cavanaugh Dr.
Carp, ON, Canada, K0A 1L0
613-839-5572 phone, 613-839-5830 FAX
info@senstarstellar.com

Senstar Stellar

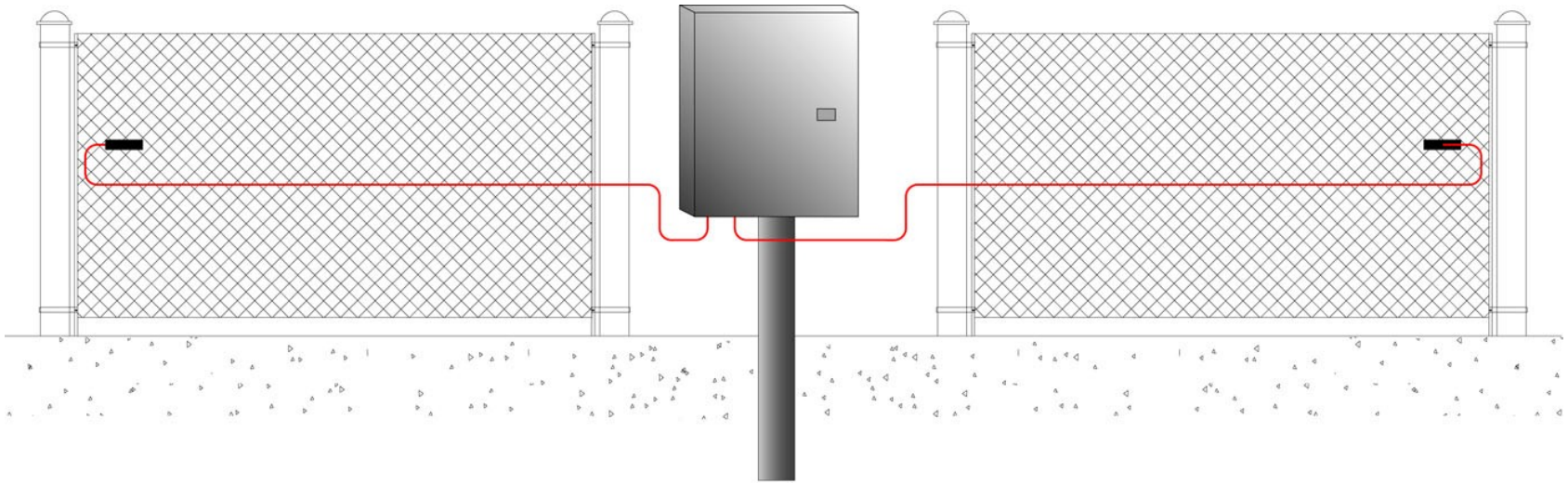
Presentation Overview

- What is IntelliFIBER?
- Advancements
- Field Applications and Tests
- Conclusions

Senstar Stellar

What is IntelliFIBER?

- Disturbance-sensitive fiber optic cable is installed on existing chain link/metal fences
- Cables sense vibration along fence fabric caused by climbing, cutting or lifting
- Using sophisticated adaptive algorithms, the signal processor monitors cable signals to separate intrusions from environmental effects and produce valid alarms



Senstar Stellar

IntelliFIBER Features

- Detects attempts to cut, climb-over or lift the fabric of metal mesh fences
- Why fiber? –latest technology sensor cable is applicable to long zone lengths, very resistant to lightning, EMI, RFI
- Monitors up to 2000 m (6256 ft.) of sensor cable per zone
- Allows independent calibration of cut and climb scenarios for each zone
- Features “Adaptive Algorithms” which virtually ignore weather related events

Senstar Stellar

IntelliFIBER Features (continued)

- Provides independent intrusion and supervision alarm outputs for each zone
- Available with either relay outputs or multiplex interface to:
  - Intelli-FLEX/FIBER Central Controller
  - StarNeT 1000
  - Senstar 100
- Backward compatibility with Intelli-FLEX
- Fiber optic interface is achieved through a daughter card on the Intelli-FLEX processor
- Proven digital processing, identical to Intelli-FLEX

Senstar Stellar

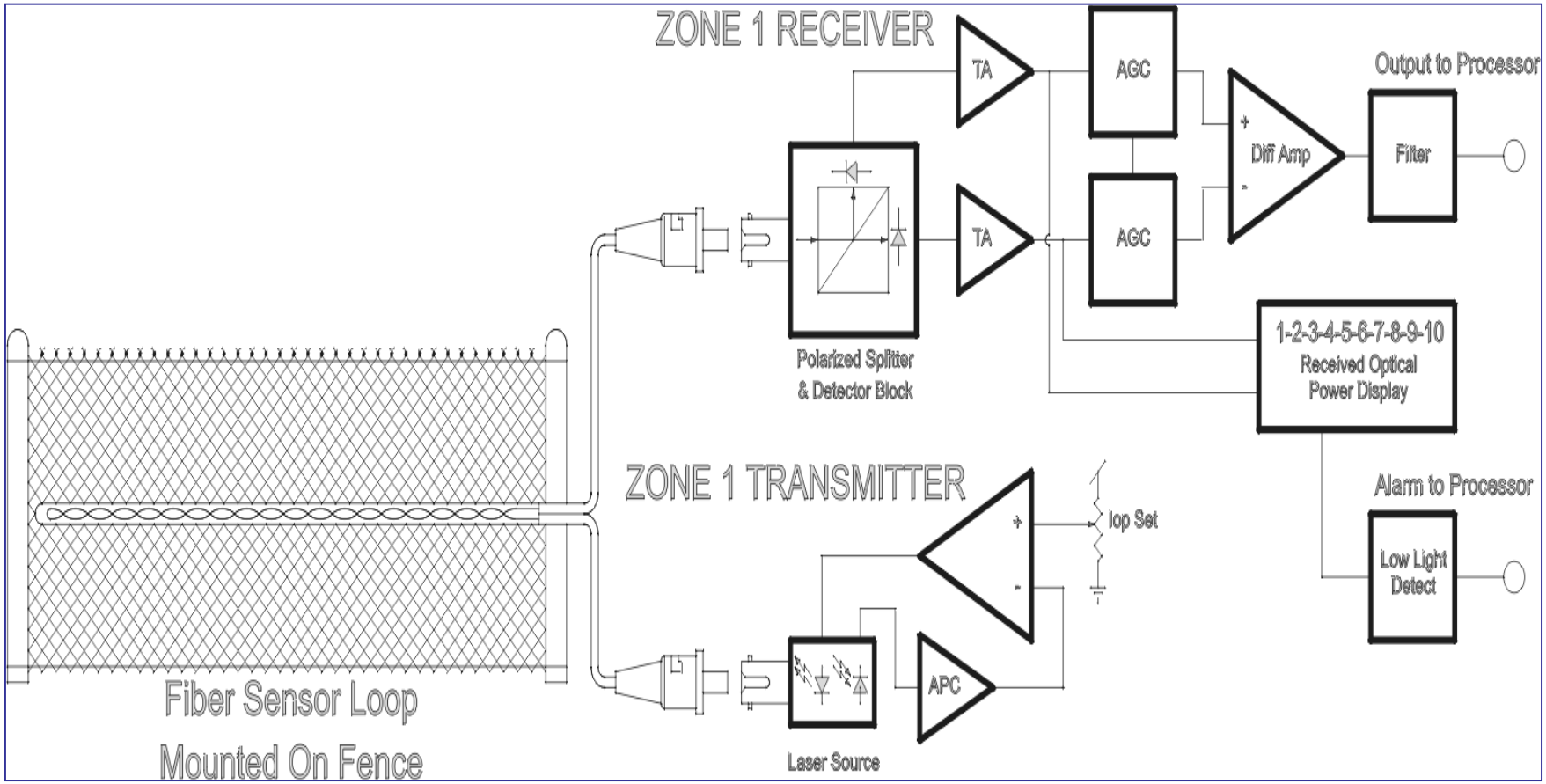
How Does IntelliFIBER Work?

- **A laser diode transmitter sends out infrared light at 785 nm**
- **A splitter/analyzer in the receiver separates the horizontally and vertically polarized components of the light**
- **A comparator looks for changes in the ratio of horizontally and vertically polarized light**
  - changes are created by micro-movements of the fiber optic cable
  - ratio is independent of total beam intensity, which does change with temperature
- **The change signal is converted into an electrical signal, amplified and sent to the processor for analysis**

Senstar Stellar

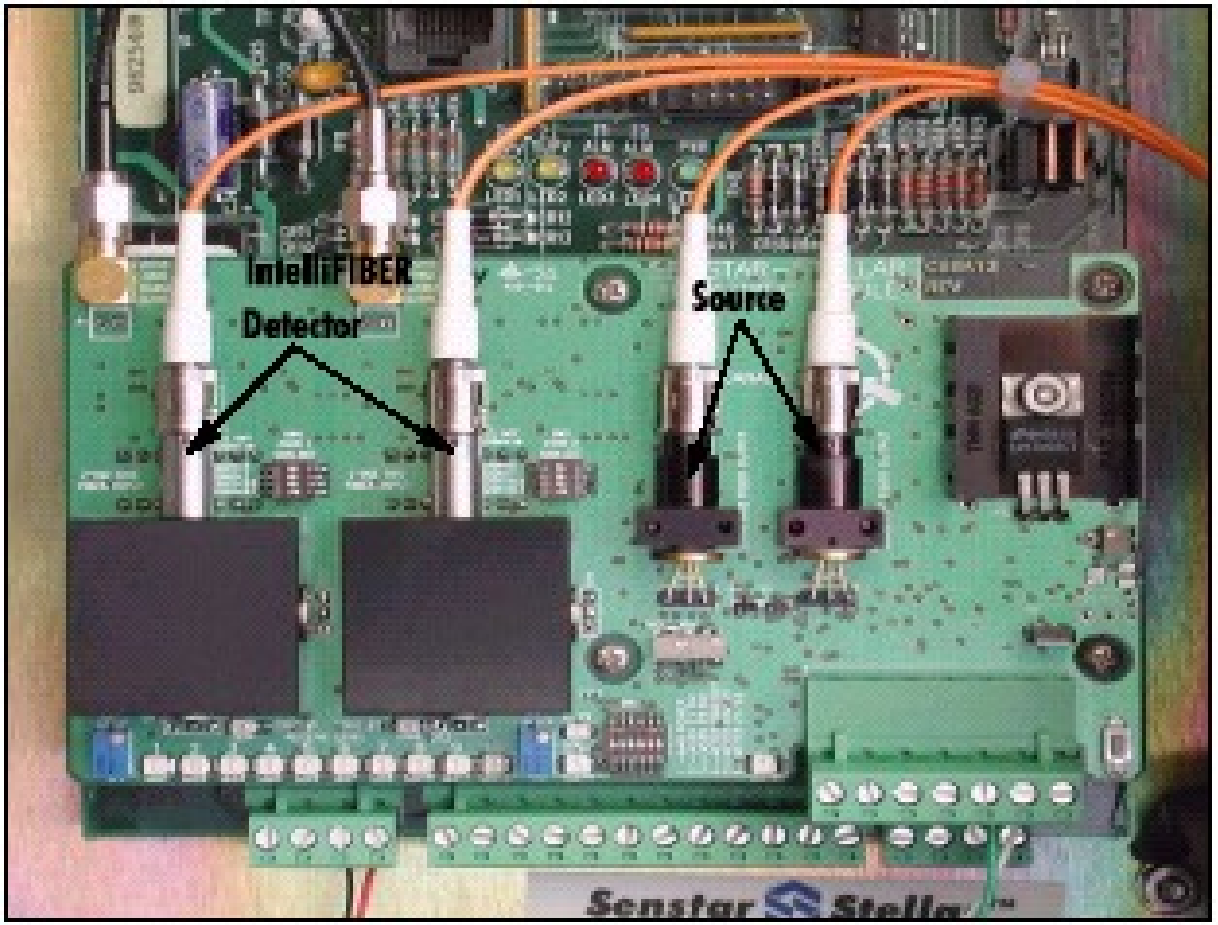
IntelliFIBER™ - Functional Block Diagram

Theory of Operation



Senstar Stellar

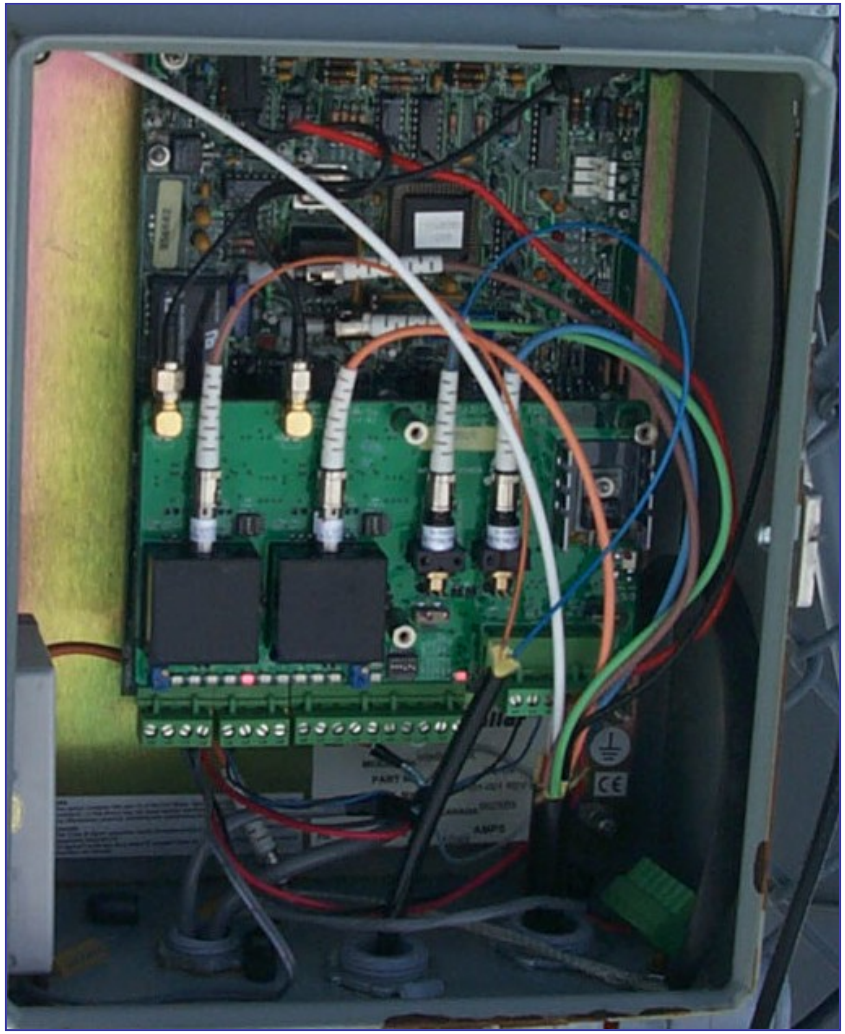
Hardware - Processor



IntelliFIBER fiber optic interface board

Senstar Stellar

Processor in Enclosure



Senstar Stellar

Components to Match to the SITE Features

- singe standalone sensor, to large network interfaced to control and display systems
- new cable types for minimal field hardware (and cost)
- other sensors and local inputs and outputs
- methods to handle gates

Senstar Stellar

Advancements - New Sensor Cables

- **Four different cable types to best match the application**
  - **2-core**
  - **4-core**
  - **4-core plus power**
  - **Armoured for vandalism protection**
- **Available in various continuous lengths**
  - **1000 m (3281 ft.), 300 m (1000 ft.), 200 m (656 ft.) and 100 m (328 ft.)**

Senstar Stellar

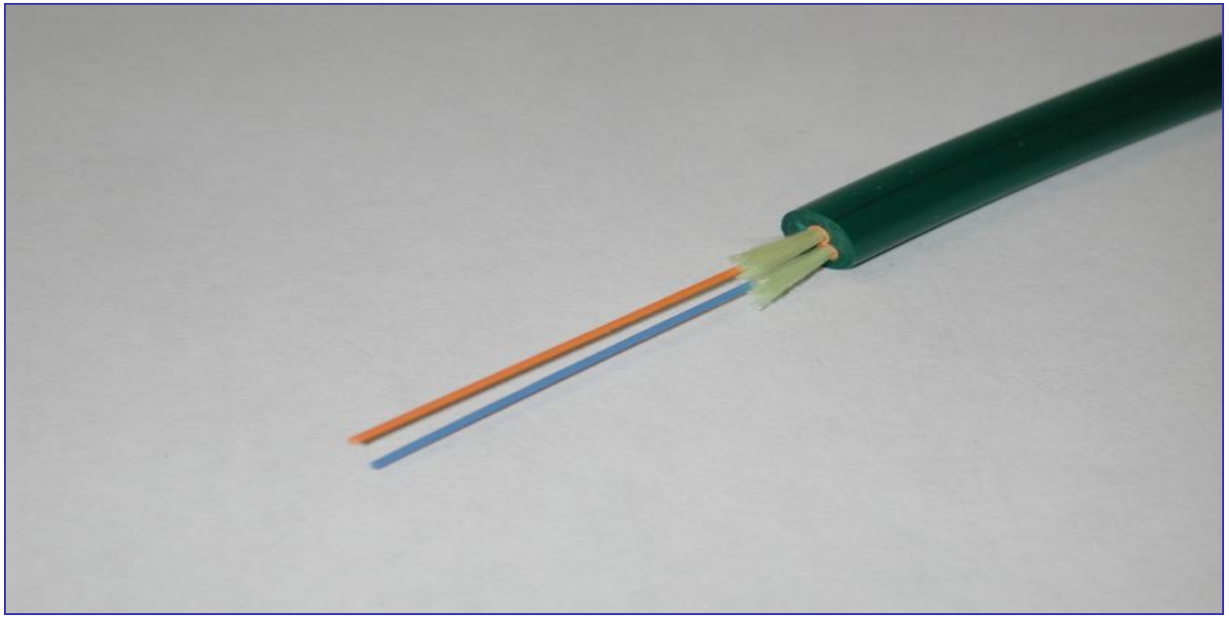
Developments in the IntelliFIBER Fiber Optic Fence Sensor

Fiber Types & Installation

Senstar Stellar

New Sensor Cables

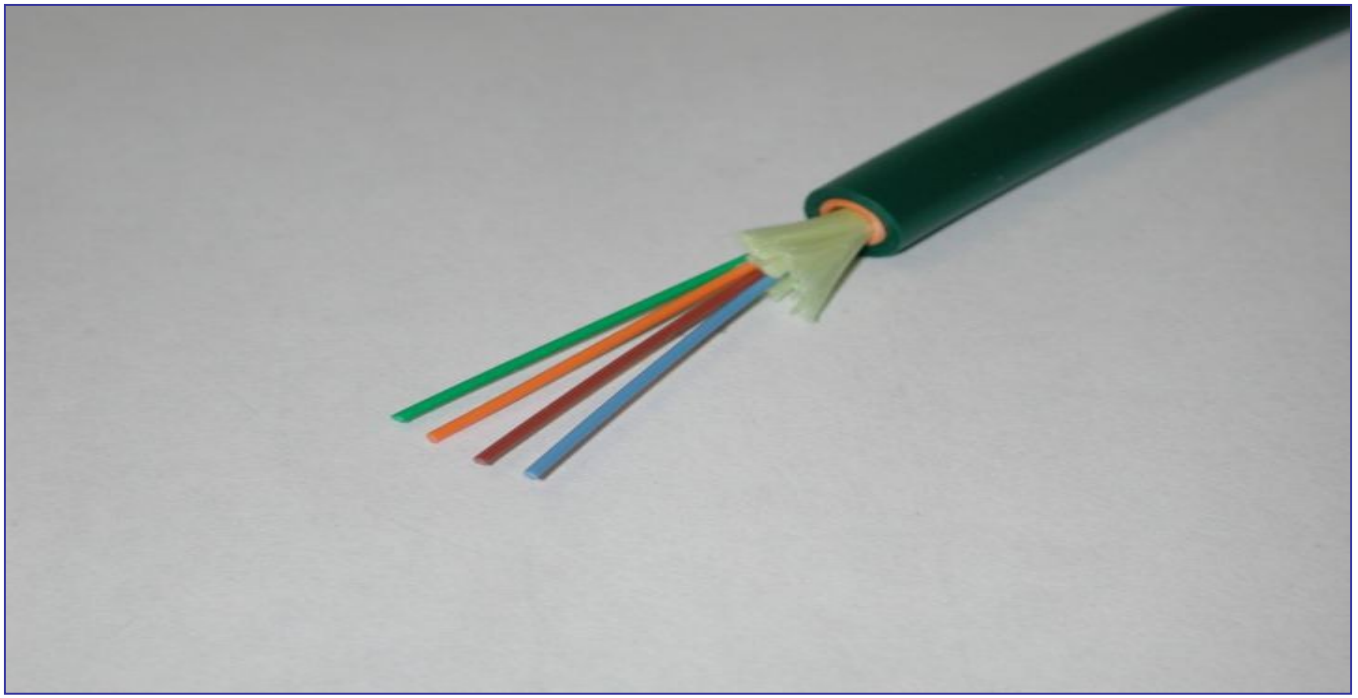
- **IntelliFIBER has 4 different sensor cable options:**
  - Dual fiber cable for single pass (built-in return) for detection only



Senstar Stellar

Sensor Cables (Continued)

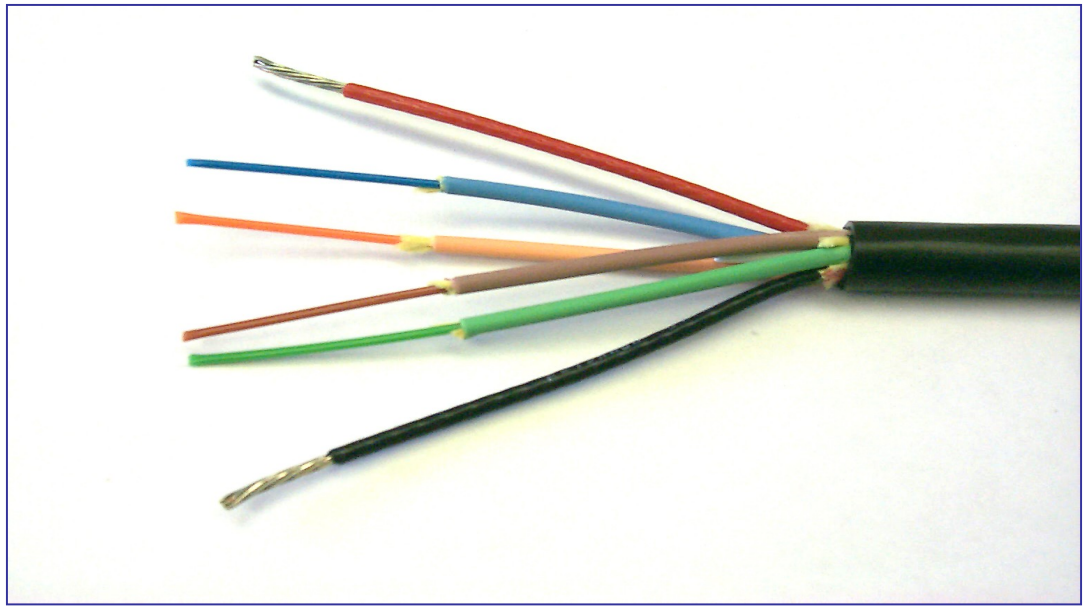
- Quad (4) fiber cable: 2 for detection, 2 for data transmission in a networked application



Senstar Stellar

Sensor Cables (Continued)

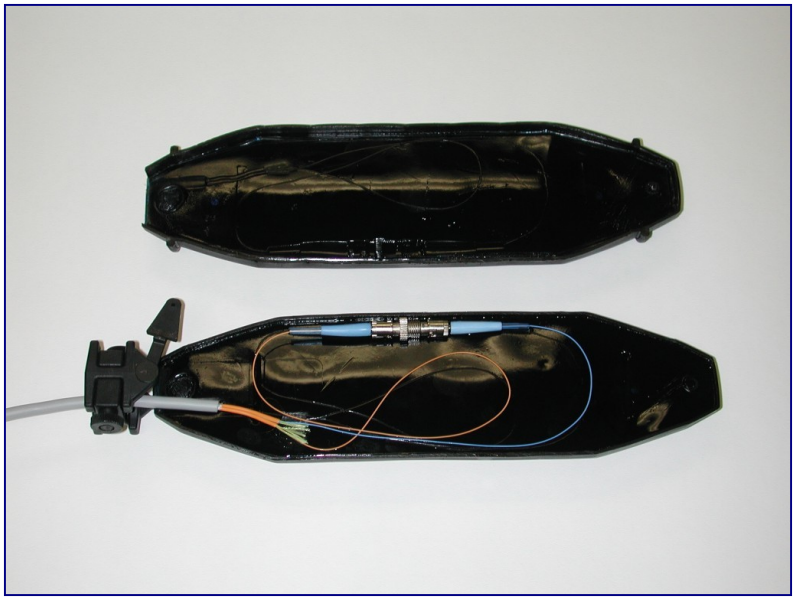
- Quad (4) fiber with 2 #14 AWG copper conductors for DC power distribution through same single cable on the fence, or power distribution protection
- Saves cost of separate power distribution network
- Also vandal-resistant armoured version



Senstar Stellar

Other IntelliFIBER System Components

Splice/Terminator Kit



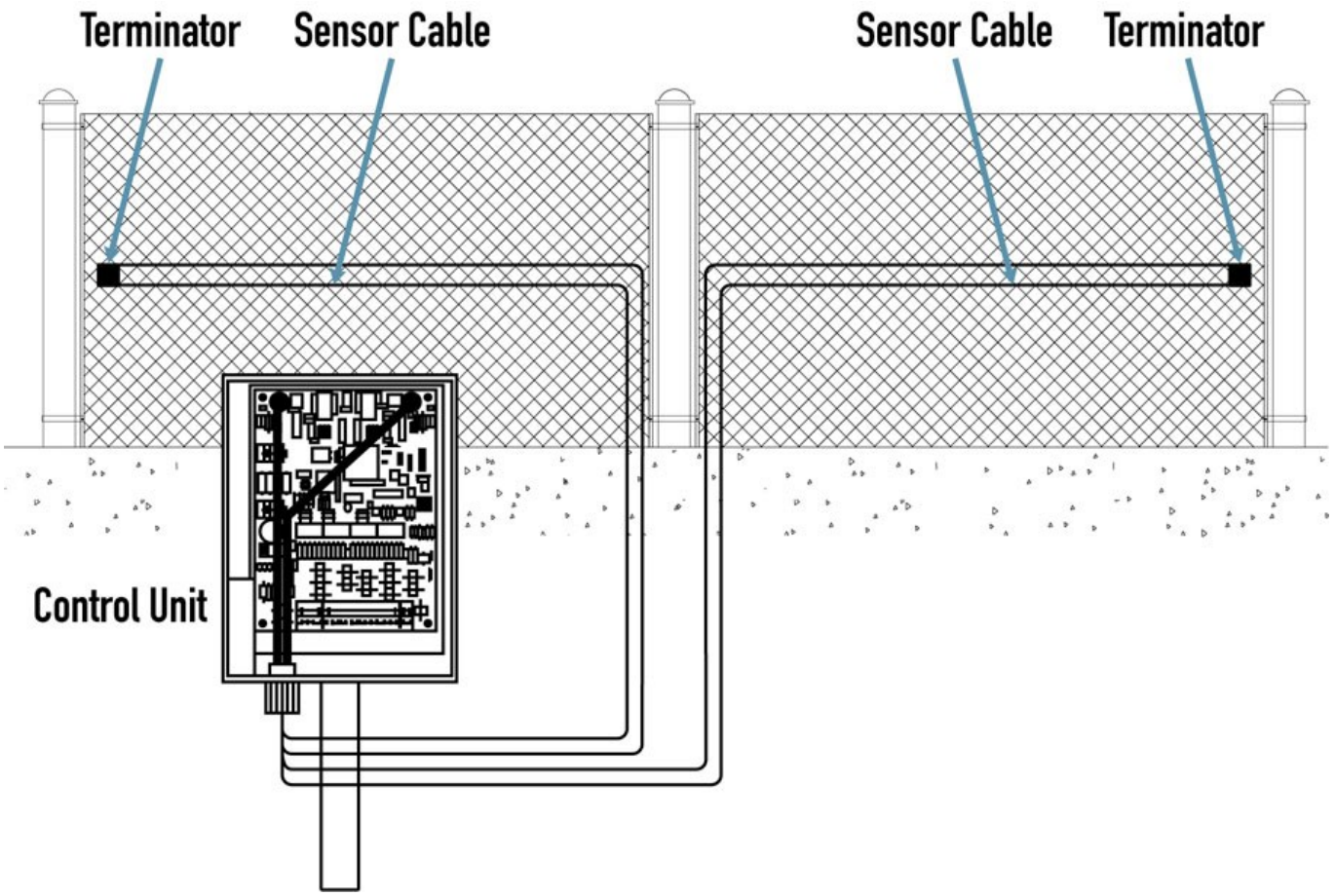
Gelsnap open

Gelsnap closed

Senstar Stellar

Typical Standalone Configuration

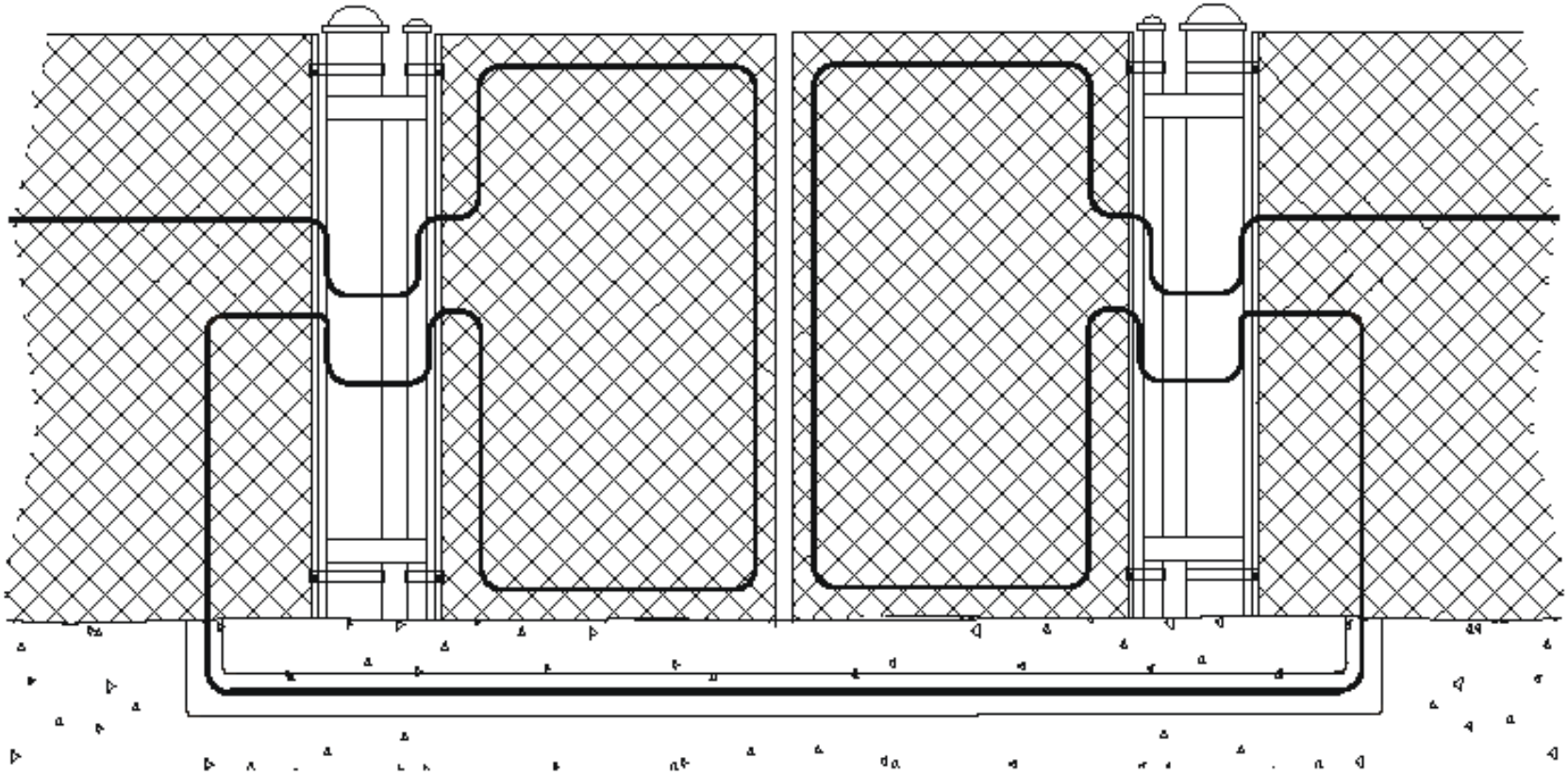
Dual zone deployment



Senstar Stellar

Sample Gate Installation

Applying IntelliFIBER to actual site features

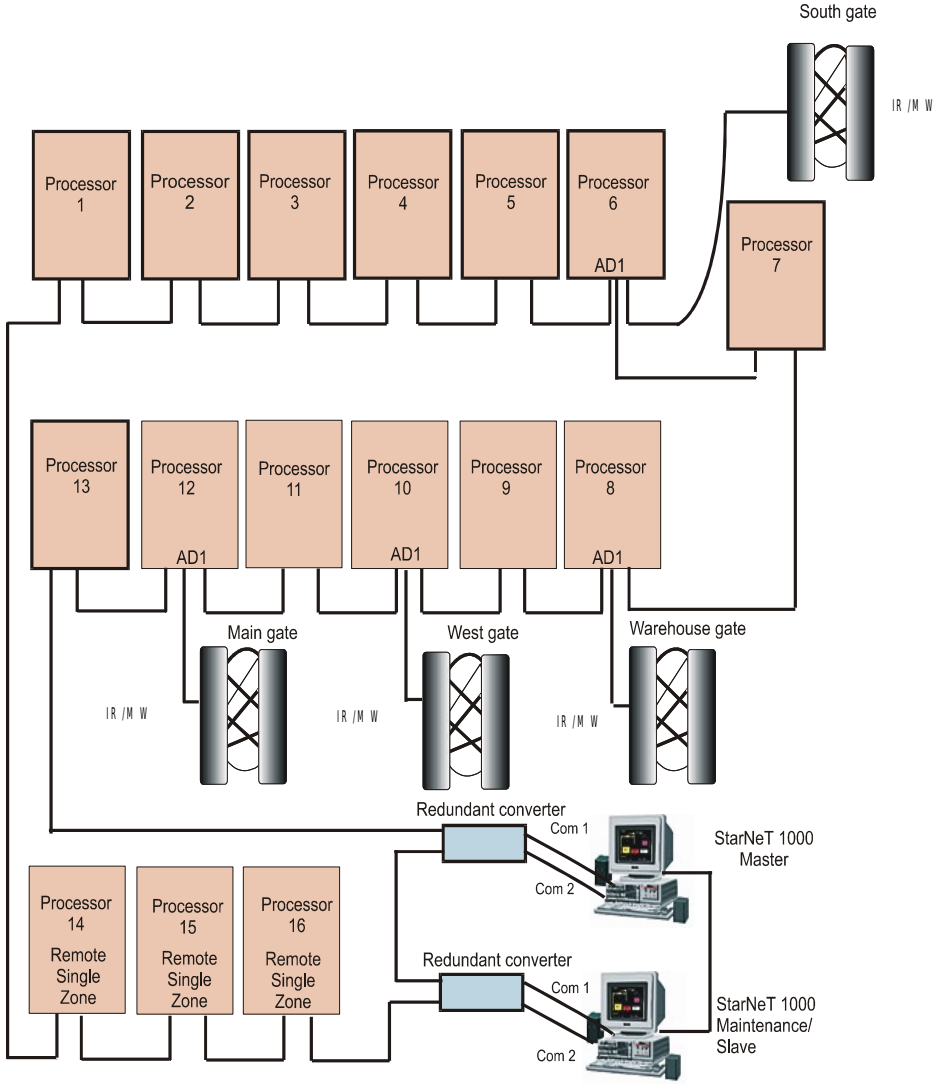


Senstar Stellar

Example Gate Installation

Senstar Stellar

Applications - Networking of Multiple Sensors

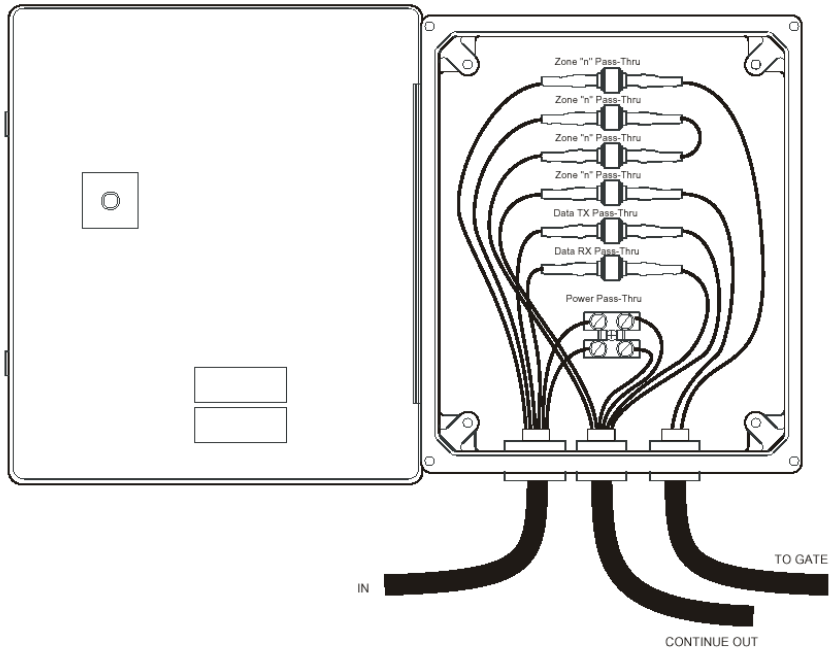


Senstar Stellar

Installation

Fiber cable four core with copper gate kit

4 fiber plus 2 copper



NOTES
1. Fiber bends shown tighter than normal for clarity

2. Normal cable management techniques apply for any excess fiber.

Senstar Stellar

Installation

Typical connections for sensor loopback and fiber network

Senstar Stellar

Calibration

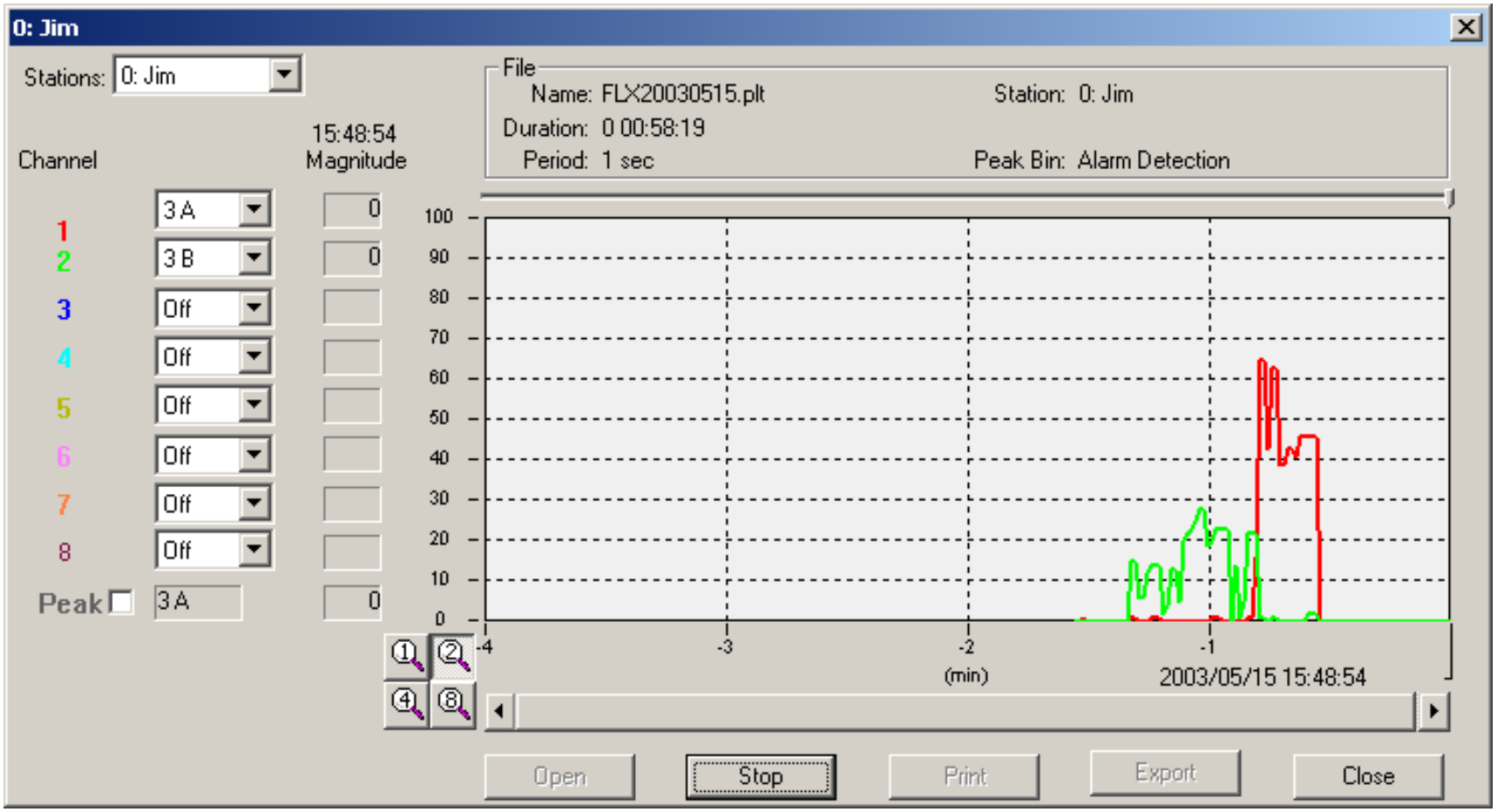
- **To best detect the intruder and not the environment**
- **Can do locally at the perimeter with testing for cut and climb**
  - use of configuration module at each zone
- **New feature – can use StarNeT interface for centralized response recording of zones for entire perimeter**

Senstar Stellar

Calibration: Handheld Configuration Module

Senstar Stellar

StarNET Maintenance Display – Multiple Zone Tool



Senstar Stellar

IntelliFIBER - Testing and Performance

Testing at Senstar-Stellar S.I.T.E., Ottawa since 2000

Senstar Stellar

IntelliFIBER - Testing

- **Typical 12’ chain-link fence application,**
- **100 meters long**
- **IntelliFIBER and Intelli-FLEX**

Senstar Stellar

IntelliFIBER - Testing

Fence testing
– climbs and simulated cuts

Senstar Stellar

IntelliFIBER Performance

Test Details:

- different fiber types running concurrently on same fence
- Calibration for climbs and cuts (simulated) Pd; see plot for typical along cable performance and test environment
- Long term monitoring for false and nuisance alarms (FAR/NAR) versus environment
  - Sample result, nominal 100m. zone, 4+2 cable; running since February 2003 (1062 logged hours):

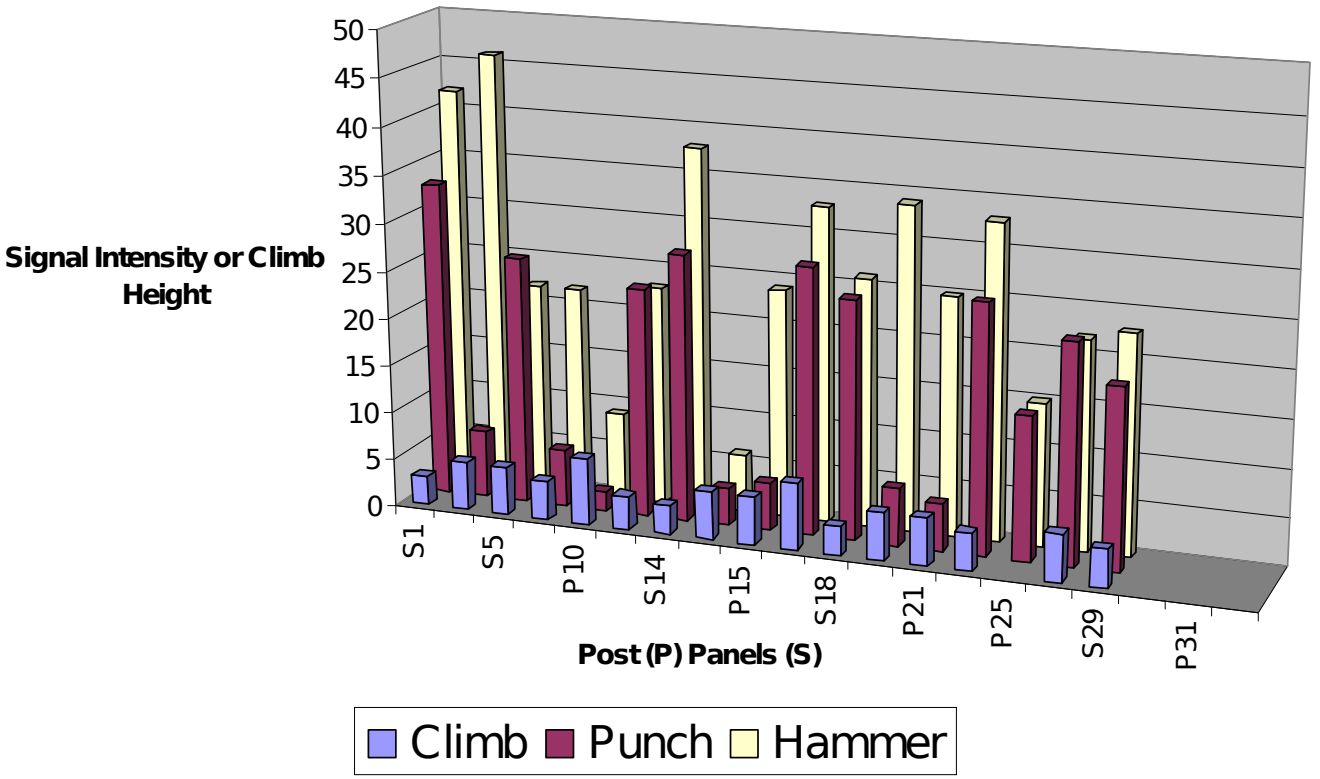
-less than 0.00 combined false and nuisance alarms/zone/day for IntelliFIBER

-compares well to 0.02 with Intelli-FLEX

*performance dependent on specifics of fence, calibration etc.

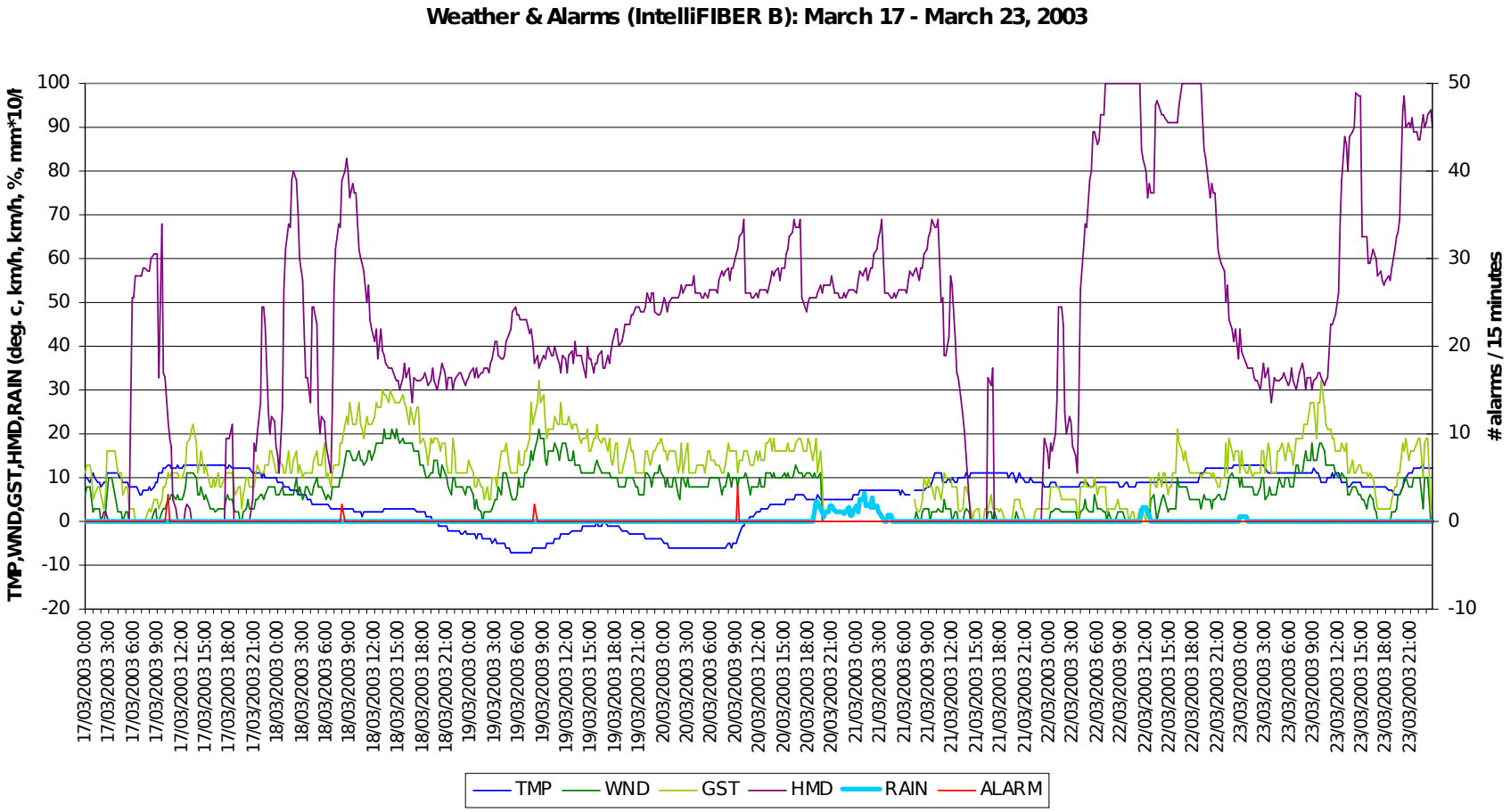
Senstar Stellar

Typical Test Plot - Cut and Climb



Senstar Stellar

IntelliFIBER - Long Term Monitoring- Typical Log Data



Senstar Stellar

Conclusions

- **IntelliFIBER is a fence-mounted fiber optic–based intrusion detection sensor**
  - outdoor and interior applications
- **Different cable options available for standalone, network, and securing auxiliary data**
- **Flexible installation alternatives; fence types, gates, auxiliary sensors**
- **Field tested for all-weather environmental performance**

Senstar Stellar